UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND
TOXIC SUBSTANCES

Memorandum

Date: August 29, 2001

SUBJECT: Initial Benefits Assessment for Azinphos-methyl and Phosmet on Pistachios

FROM: Pat Cimino, Entomologist
Minor Use Officer
Immediate Office

Kathy Davis, Environmental Protection Specialist
Herbicide and Insecticide Branch

David Donaldson, Economist
Economic Analysis Branch
Biological and Economic Analysis Division (7503C)

THROUGH: David Brassard, Senior Entomologist
Jonathan Becker, Acting Chief
Herbicide and Insecticide Branch

Arthur Grube, Senior Economist
David Widawsky, Acting Chief
Economic Analysis Branch

TO: Veronique LaCapra, Chemical Review Manager
Diane Isbel, Chemical Review Manager
Margaret Rice, Chief
Reregistration Branch 2
Special Review and Reregistration Division (7508C)

CC: Denise Keehner, Director
Biological and Economic Analysis Division

Summary

Based on available published information and personal communications with crop experts, BEAD believes that extending the restricted entry intervals for phosmet and azinphos-methyl for use on pistachios would not significantly impact growers, because short-term post-application activities are mechanized and human exposure is expected to be low.

Background

Nearly all the US commercial production of pistachios takes place in California, due to its unique climatic conditions. A rainy, mild winter followed by dry and warm weather in the spring and summer provide ideal conditions for pistachios to flourish. However, because of California's climate, irrigation is usually necessary.

Pistachios are started in nurseries, and grown for fifteen months in pots. A tree begins producing small amounts of nuts in five or six years.

Activities in the orchard take place mostly in the spring and summer, when irrigation, weed management, sampling for nutrient levels, and monitoring for pest and disease problems and for nut maturity are necessary. Irrigation is generally mini- or micro-sprinkler, with some drip irrigation.

The pistachio production season starts in March in California, with bud swell followed by bloom in early April. Leaves and shoots appear in early May. During May and June, the nutshell hardens, although nut-fill will not take place until July. As nut-fill continues, the shell splits, usually around the end of July to early August. The hull protecting the shell is intact but easily removed. Harvest begins in early to mid-September, when the nut clusters fall readily upon shaking, and is timed to maximize the number of split nuts. Rapid processing after harvest ensures a higher quality of nut.

After the harvest is complete, the trees become dormant (November through March). Trees are pruned to generate new fruiting wood and to maintain their size. As the early growing season approaches, trees are fertilized, irrigated, and weed, bird, insect and disease control is accomplished.

The average pistachio farm size, based on USDA's Census of Agriculture's 1997 data, is 90 acres.

Production Data for Pistachios

U.S. Pistachio Production

Commercial production of pistachios in the United States is primarily located in California, with about 97% of the pistachio acres and 99% of the production. Only 3% of the acreage in pistachios is located in Arizona, and there is limited acreage in New Mexico, and a bit in some other states.

There are about 71,000 bearing acres of pistachios in the US (USDA Agricultural Statistics, 1999), with an additional 28,000 acres non-bearing. In 1998, production was estimated at 188 million lbs with an estimated value of nearly $194 million.

According to a 1997 report from USDA's Economic Research Service[2], the average pistachio farm increased from 68 acres in 1987 to 90 acres in 1997, because of reduced competition with the world's largest producer, Iran.

Pest Biology for AZM and phosmet uses:

Both azinphos-methyl and phosmet are used to control the navel orangeworm.

Navel Orangeworm

Navel orangeworm is the most important pest in pistachios. It attacks the pistachio at hull split, feeding inside the nuts on the kernels. The resultant frass and webbing indicate infestation, and infested nuts are not marketable. An additional concern is that navel orangeworm damage provides entry for *Aspergillus* mold infection, which can

produce aflatoxins. Aflatoxins are potent carcinogens, the presence of which is strictly limited in pistachio commerce.

Navel orangeworm larvae overwinter inside nuts left on the tree and in trash nuts left on the ground. Consequently, one of the most effective cultural controls for the pest is the elimination of unharvested nuts in the orchard to reduce overwintering sites. Early hull split - as a result of disease, insect, or wind damage - can also increase navel orangeworm population levels by providing an additional food source. Harvesting the nuts as early as possible to manage worm infestation is an important tool in controlling the navel orangeworm.

Adjacent almond orchards can also influence populations of navel orangeworm, because almonds are harvested about a month before pistachios, the moths readily migrate to pistachios after almond harvest. Egg traps are used to monitor navel orangeworm and provide proper timing for applying in-season insecticide applications.

Cultural Controls

An early, rapid harvest reduces the opportunity for navel orangeworm larvae to gain access to nuts, reducing the potential for a population increase in the orchard. Because the navel orangeworm larvae overwinter in mummy nuts, the mummies must be removed and destroyed in a timely manner. Shakers are typically used to remove nut clusters. Mummy nuts in the trees can become more difficult to remove if the orchard has been impacted by citrus flat mites or disease. Good sanitation - cleanup of extra nuts - is a must around areas where nuts have been handled.

Biological Controls

Two parasitoids, *Goniozus legneri* and *Copidosomapsis plethorica*, provide some level of control of the navel orangeworm in pistachios, but are not effective, by themselves, in controlling the pest.

Bacillus thuringiensis has not been effective.

Pheromone mating confusion for navel orangeworm is being researched, but its use may be limited to large pistachio farm operations where the pheromone can be adequately dispersed.

Chemical Control

Control of the navel orangeworm in pistachios with insecticides can reduce the population by 65 to 75% with one well-timed application. Because mites are not as much a problem in pistachios, pyrethroids (permethrin) is used more than in other crops.

Azinphos-methyl - 21 days PHI. Data from CA DPR indicate that in 1997, azinphos methyl was applied once a year, at hull split, to 17% of the acres at an average rate of 2 lb. a.i. per acre[1]. This is the preferred material because of its longer residual, which makes it useful to control multiple flights. Secondary pest problems with this use have not been observed.

Permethrin – 0 day PHI. Used also to control other pests (stink bugs and phytocoris), it is an important tool if navel orangeworm outbreaks occur near harvest. In 1997, nearly 40% of the acreage was treated once with permethrin at a median application rate of 0.2 lbs. ai per acre.

Carbaryl - 14 day PHI. In 1997, DPR data indicate that nearly 4% of the acreage was treated once at a median rate of 1.6 lbs. a.i. per acre.

Phosmet - 14 day PHI. DPR data from 1997 indicate that phosmet was used on nearly 8% of the acreage once a year at a median rate of 3.5 lb.a.i. per acre. Although some of this use was targeted at the navel orangeworm, phosmet is used to control a variety of other pests. Phosmet has a relatively shorter residual than azinphos methyl.

Spinosad - not yet registered for use in pistachios. Efficacy trials from 1998 indicate some promise of control of the navel orangeworm, but multiple applications may be necessary.

Tebufenozide - not yet registered for use in pistachios. Efficacy trials from 1998 indicate some activity, but further research is needed.

Azinphos-methyl and Phosmet Usage in California

Azinphos-methyl

Between 1995 and 1999, an average of 21% of California pistachio bearing acreage was treated with azinphos-methyl annually, and about 156,000 pounds of azinphos-methyl were applied. The average number of applications of azinphos-methyl per year in California is 1.04 with an application rate of 2 lbs of ai per acre.

Phosmet

Between 1996 and 1999, an average of 10.5% of the California pistachio bearing acreage was treated with phosmet. However, phosmet usage increased significantly between 1998 and 1999, with CA DPR data showing usage in 1998 at 7.04% of the base acres treated, and in 1999, more than 27% of the base acres were treated. The average number of applications of phosmet per year in California is 1.1 with an average application rate of 3.1 pounds ai per acre per application.

Usage of Azinphos-methyl and Phosmet by Target Pest

Azinphos-methyl Azinphos-methyl usage on pistachios is primarily for the control of the navel orangeworm, largely because it has the longest residual. It is limited to one application per year, so growers tend to use it to target their most important insect pest, the navel orangeworm.

Phosmet The pistachio target pests for phosmet are, in order of amount targeted, the flat mite, the oblique-banded leafroller and other leafrollers, followed by the navel orangeworm. Some use is targeted at the true bugs.

There are few worker activities in the orchard after the application of the azinphos-methyl or phosmet at pistachio hull split. Pistachios are entirely machine-harvested, with mechanical shakers removing the nut clusters from the tree, and the nuts dropping into a conveyor mechanism that moves the pistachios into trucks. Pistachios, unlike almonds, are not allowed to dry on the orchard floor.

Azinphos-methyl:

Registrant proposed REI's	Not Available
PHI	21 days

Phosmet:

Registrant proposed REI's	14 days for hand harvest
PHI	14 days

Please refer to the occupational and residential human health risk assessment on the Agency's website (http://www.epa.gov/pesticides/op) for information concerning the worker risks associated with the restricted entry intervals for this chemical.

Nuts are mostly removed by mechanical shakers and poling. Pruning occurs in winter (November through March) and extending the REIs for the above activities would be expected to have minimal impact.

Sources

USDA Crop Profile for Pistachios in CA